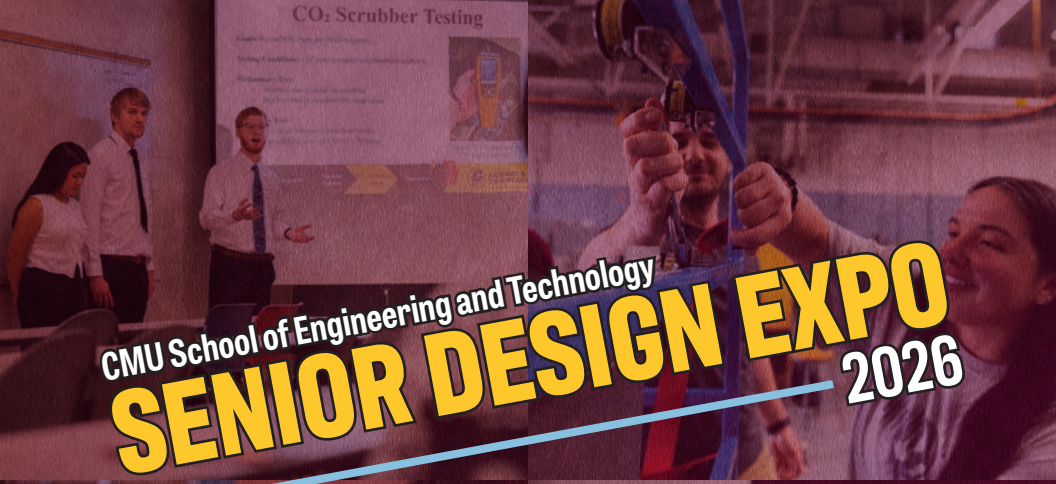

CMU School of Engineering and Technology

SENIOR DESIGN EXPO 2026

AN UNDERGRADUATE STUDENT PROJECT SHOWCASE

COLLEGE OF SCIENCE & ENGINEERING

SCHOOL OF ENGINEERING & TECHNOLOGY

CENTRAL MICHIGAN UNIVERSITY

Welcome to the 2026 School of Engineering & Technology Senior Design Expo!

Today, we celebrate the achievements of our senior-level students - congratulations! The Senior Design Expo is an exciting opportunity to see how our students have brought their classroom experiences, hard work, and critical teamwork skills to solve real-world problems. The students have worked throughout the year on the design and implementation of their work.

I would like to extend my deepest gratitude to our industry sponsors for providing challenging problems, resources, technical support, and advice. Thank you to our faculty, who have not only guided students through the design and implementation process this year but have mentored students in and out of the classroom. Thank you to Sai Koneru (Senior Design Manager), Dr. Karadogan (Director of the School of Engineering & Technology), and the entire School of Engineering & Technology staff for your continued support of our students. Finally, thank you to all families and friends who have cheered on our students during their time at CMU.

Tracy Galarowicz, Ph.D.
Interim Dean
College of Science and Engineering

Once again, we are proud to welcome you to the Senior Design Expo at the School of Engineering and Technology (SET)!

At SET, our students learn by doing—designing, building, and testing real-world systems from day one, supported by close faculty mentorship and industry-aligned, ABET-accredited programs. The senior design experience is a direct result of that approach.

The prototypes you see today and the presentations you attend reflect our students' perseverance, hard work, and can-do attitude. In many cases, they have stepped outside their comfort zones—learning new concepts and tackling challenges that don't have answers in the back of a textbook. This is clear evidence of their readiness, their commitment to growth, and their drive to become productive members of the workforce or academia through lifelong learning.

I would like to thank Dr. Benjamin Ritter and Mr. Sai Koneru, SET's Senior Design Manager, for their leadership and support of our senior design students this year; our faculty advisors for their technical expertise and mentorship; and our sponsors and their teams for investing in the development of tomorrow's engineers. I also extend my appreciation to Interim Dean Dr. Tracy Galarowicz and Associate Dean Dr. Christopher Tycner of the College of Science and Engineering, as well as CMU leadership, for helping to create the opportunities that make experiences like this possible.

The success of our senior design program—and the work you see today—is built on this collective support. I am proud to be part of the SET community, where faculty, staff, students, and external partners come together to make these experiences possible.

Fire Up!

Ernur Karadogan, Ph.D.
Director, School of Engineering and Technology

Welcome to the 2026 Design Expo hosted by the School of Engineering and Technology at Central Michigan University.

Today's event highlights the creativity, persistence, and technical skill our student design teams have demonstrated throughout the 2025–2026 academic year, supported by dedicated faculty and industry partners.

Over the past year, our senior design teams have tackled a wide range of real-world engineering challenges. Their projects span a wide range of systems including leveling and lifting solutions, automated sand blasting, assembly line, composite testing solutions, submersible electrical upgrade and water grit removal solutions, all designed to enhance safety, boost productivity, and reduce downtime for manufacturers.

Several teams shaped their projects such as casting & machining Axe, logistics container for space mission with a strong focus on entering CAST IN STEEL national and WERC international competitions, refining their work specifically to meet the standards and expectations of these competitive events.

This Expo features 13 senior capstone projects, along with additional work from our Computer Science and Mechatronics programs. Each project represents months of collaboration among students, faculty mentors, and sponsoring organizations. Together, they've built not only functional prototypes but also a strong foundation of teamwork and professional readiness.

The knowledge and experience our students have gained—technical expertise, problem-solving ability, and a commitment to seeing projects through—will accompany them as they move into their careers and begin contributing to the engineering profession. None of this would be possible without the continued support of our faculty and sponsors.

We invite you to explore the impressive accomplishments on display and celebrate the hard work of our teams.

Sai Koneru
Senior Design Manager
School of Engineering & Technology
Central Michigan University

CMU SCHOOL OF ENGINEERING AND TECHNOLOGY

DESIGN EXPO

SPRING 2026 | May 1, 2026

Hallway

- Poster Presentations 9:00 - 10:45 a.m.

Room ET 116

- 1 - SAPA Transmission: Belleville Washer Stacking System
  - 11:00 presentation | 11:20 Q & A
- 2 - Bradford White: Water Heaters Lift and Tilt System
  - 11:30 presentation | 11:50 Q & A
- 3 - XALT Energy: Mixing Vessel Hoist and Stand System
  - 12:00 presentation | 12:20 Q & A

Room ET 132

- Vantage Plastics: Extrusion Die Lift and Separation Device
  - 11:00 presentation | 11:20 Q & A
- Vantage Plastics: Precision Laser Leveling System
  - 11:30 presentation | 11:50 Q & A
- CFSpan: Automated Feed, Load and Run for Carbon Fiber Boards
  - 12:00 presentation | 12:20 Q & A

Room ET 138

- City of Midland: Grit Removal System
  - 11:00 presentation | 11:20 Q & A
- Highland Plastics: Thermal Performance Evaluation System
  - 11:30 presentation | 11:50 Q & A
- Federal Broach: Media Blast Unit
  - 12:00 presentation | 12:20 Q & A

Room ET 153

- Biosciences: Submersible Electrical Systems Upgrade
  - 11:00 presentation | 11:20 Q&A
- Bay Cast: Cast In Steel - The Horseman's Axe (Alpha Team)
  - 11:30 presentation | 11:50 Q&A
- Bay Cast: Cast in Steel - The Horseman's Axe (Beta Team)
  - 12:00 presentation | 12:20 Q&A
- InSciTE: WERC Environmental Design Contest - Logistics Containers for Artemis III Lunar Mission
  - 12:30 presentation | 12:50 Q&A

We extend our sincere thanks
innovation and making this

DEPARTMENT OF DEFENSE

to our sponsors for powering Senior Design Expo possible

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BRADFORD WHITE WATER HEATERS

Project Name: Water Heaters Lift and Tilt System
Academic Advisor: Dr. Dru Wilson | School of Engineering and Technology
Industry Advisor: Richard Courtade | Engineering Laboratory Manager

TEAM MEMBERS:
Alayna Lascoe | *Product Design Engineering Technology*
Chase Kieliszewski | *Industrial Engineering Technology*
Logan Maxey | *Industrial Engineering Technology*
William Rappuhn | *Mechanical Engineering Technology*
Samuel Rankine | *Mechanical Engineering Technology*
Micheal Dunayer | *Mechanical Engineering Technology*

Abstract:

Bradford White manufactures water heaters in a wide range of sizes, many of which require careful handling during testing and inspection. The current method makes it hard to test water heaters due to technical errors, such as not locking the water heater in place. It can be challenging for a single technician to lift and position these water heaters, with some weighing up to 1,000 pounds when empty. To solve this problem, Bradford White asked the Senior Design team to design and build a lift to raise and rotate the water heater tanks, allowing a safer way to conduct testing. The exact requirements for this project were:

- Lift and support heavy loads
- Provide smooth, controlled rotation to lay the water heater in a horizontal position
- Prevent denting of the outer surface while handling
- Allow access to all sides of the appliance for testing

The outcome of the problem was creating a design that integrates stability, safety, and ease of operation so that a technician can efficiently secure, position, and access the water heater for testing. By combining durable structural components with features that prioritize product protection, the lift table improves testing within Bradford White's operations.

BAY CAST - TEAM A

Project Name: Cast In Steel - The Horseman's Axe
Academic Advisor: Dr. Samson Lee | School of Engineering and Technology
Industry Advisor: Anup Shresta | Foundry Engineer

TEAM MEMBERS:
Gavin Kelly | *Mechanical Engineering*
Dalton Sargent | *Mechanical Engineering*
Ashton Thompson | *Mechanical Engineering*
Brett Szydlowski | *Product Design Engineering Technology*
Timothy Stahl | *Mechanical Engineering Technology*

Abstract:

A team of five students from Central Michigan University, along with leading foundry partner Bay Cast, competed in the Steel Founders' Society of America (SFSA) 2026 Cast in Steel Competition. SFSA has created this competition to encourage students to learn about making steel products using the casting process and applying the latest technology available. This year's competition tasked universities with using casting to design and manufacture a unique but historically accurate one-handed Horseman's Axe. Several axe designs were developed using historical research and conceptual design scoring based on competition requirements. Computer Aided Design was used to model the axes, finite element analysis and flow simulations were used to validate the strength and manufacturability of each design. Once validated, Bay Cast assisted in the casting process from start to finish; ensuring that every step from mold creation to pouring resulted in the successful creation of our axes.

This project is part of the Cast in Steel national competition.

SFSA

Learn more about Cast in Steel

BAY CAST - TEAM B

Project Name: Cast in Steel - The Horseman's Axe
Academic Advisor: Dr. Samson Lee | School of Engineering and Technology
Industry Advisor: Anup Shresta | Foundry Engineer

TEAM MEMBERS:
Sadie Boorman | *Industrial Engineering Technology*
Alexis Marenger | *Mechanical Engineering*
Aydan Sparks | *Mechanical Engineering*
Nathaniel Thomas | *Product Design Engineering Technology*
Matthew Wakulsky | *Mechanical Engineering Technology*

Abstract:

For the 2026 Cast in Steel competition hosted by the Steel Founders' Society of America, Central Michigan University partnered with Bay Cast to produce a functional Horseman's Axe. Our team, The Choppewas, completed all design work, including historical research, concept modeling, CAD development, and finite element analysis to check strength and confirm the design before casting. Bay Cast recommended the steel grade and provided guidance on the gating layout, which we used to prepare a castable final design. After the casting was poured, we faced a major setback when the back spike, an important feature of our geometry, was accidentally removed during cleanup. Welding a new spike was considered, but we chose not to do it to avoid weakening the axe. Instead, we reshaped a new spike from the remaining cast material, which required adjusting our original design but kept the tool structurally sound. Once the geometry was restored, we performed rough grinding, manual machining, and CNC milling to bring the axe to its final shape. The axe was then heat-treated by heating to temperature and quenching in oil to improve hardness and durability. The completed axe represents our full engineering process, from design and analysis to solving unexpected manufacturing challenges and completing hands-on finishing and heat-treatment work

This project is part of the Cast in Steel national competition.

SFSA

Learn more about
Cast in Steel

CF SPAN

Project Name: Automated Feed, Load, and Run for Carbon Fiber Boards
Academic Advisor: Dr. Adam Mock | School of Engineering and Technology
Industry Advisors: Dan Logan | Production Engineer
Eli Rytlewski | Operations Manager

TEAM MEMBERS:
Abigail Hogan | *Computer Engineering*
Joseph Hoy | *Electrical Engineering*
Leila Kahler | *Mechanical Engineering*
Kyle Kieser | *Electrical Engineering*
Nicholas Palazzolo | *Product Design Engineering Technology*
Austin Reid | *Mechanical Engineering*
Lucia Dominguez Rodriguez | *Electrical and Computer Engineering*

Abstract:

This project focuses on developing an automated feed, load, and stacking system for CF Span's carbon fiber adhesive line to reduce labor from two operators to one, while also improving throughput, consistency, and safety. The current process requires both operators to manually take boards from their own respective stacks and place them on the conveyor or stack the carbon fiber boards after the adhesive application. This setup creates bottlenecks, safety risks, and quality risks. To address these issues, we put forth an integrated two-stage automation system: a dispenser that loads individual boards onto the conveyor and a stacker that aligns and assembles the final stacked product. The final design solution incorporates a hydraulic lifting table, steel-frame cabinet covered in acrylic acme, and Grizzly Industrial power feeders. Additionally, the stacking system was designed for future integration to automate the process further. The stacking system uses an inclined polyethylene ramp, stepper motors to run mechanical actuator locks for the dropping portion and removal of the final CarbonBar. All components have attached e-stops following ISO standards. Electrical integration, including limit switches, laminate detection circuitry, relays, and Arduino-based control, follows all relevant standards for industrial applications. A complete bill of materials and cost model was developed with emphasis on using available CF Span components. The resulting design provides a reliable and safe path towards full automation of the adhesive line.

CITY OF MIDLAND

Project Name: Grit Removal System
Academic Advisor: Dr. Mohamed Awad | School of Engineering and Technology
Industry Advisors: Bruce Royce | Plant Manager Water Reclamation

TEAM MEMBERS:
Baily Suder | *Mechanical Engineering*
Zeta Zeneberg | *Product Design Engineering Technology*
Trevor Wight | *Mechanical Engineering Technology*
Joseph Taverna | *Computer Engineering*
Benjamin Meekhoff | *Mechanical Engineering*
Seth Treder | *Computer Engineering*
Artem Pohrebniak | *Electrical Engineering*

Abstract:

Wastewater management is essential in urban environments, ensuring the safe and efficient removal of contaminants from water treatment systems. A critical component of this process is grit removal, which targets heavy inorganic solids such as sand and gravel to prevent equipment damage, reduce clogging, and maintain consistent system flow. This project evaluates alternatives to replace the existing grit removal chambers at the facility with a more efficient and reliable system. A decision matrix and cost analysis were used to compare multiple design options based on performance, constructibility, operational reliability, and long-term economic impact. The selected design improves grit capture efficiency under variable flow conditions while minimizing maintenance requirements and supporting long-term plant operations.

FEDERAL BROACH

Project Name: Media Blast Unit
Academic Advisor: Dr. Ben Ritter | School of Engineering and Technology
Industry Advisor: Donald Finkbeiner | Operations Manager
Sonnie Guilfoy | Planner

TEAM MEMBERS:
Jenna Olkkonen | *Mechanical Engineering*
Gabrielle Tucker | *Mechanical Engineering*
Joshua Darling | *Mechanical Engineering*
Jonah Fiegel | *Product Design Engineering Technology*
Noah Ziegler | *Mechanical Engineering*

Abstract:

In partnership with Federal Broach & Machine, this senior design project addresses the development of a media blast unit that is controlled by a programmable logic controller (PLC) and equipped with an indexing head to follow helical angles. Broaching tools are required to have very precise measurements and surface finishes to provide consistent cutting, so it is critical to ensure that the media does not damage the tool. The design requirements are to accommodate tools with tooth helix angles ranging from 0 – 25o, lengths ranging from 24 to 120 inches, and diameters ranging from 0.5 to 15.75 inches. With a constant linear speed, the PLC will adjust the rotary speed and media rates based on tool length, helix angle, and diameter, which will be manually input by the operator. The media blast cabinet integrates mechanical design, controls engineering, and process optimization into one core goal: surface preparation and burr removal on helical and flat broaching tools. The project will be guided and constrained by industry standards and the customers' needs. Key deliverables include a full design package, bill of materials, and supplier list. By automating and standardizing the burr removal process, broaching tools will be cleaned more efficiently, and there will be less variability between parts.

HIGHLAND PLASTICS

Project Name: Thermal Performance Evaluation System
Academic Advisor: Dr. Mohamed Awad | School of Engineering and Technology
Industry Advisor: Ben Simmons | Chief Executive Officer

TEAM MEMBERS:
Robert Alm | *Computer Engineering*
Connor Bendele | *Computer Engineering*
Matthew Coeling | *Electrical Engineering*
Elijah Dawson | *Mechanical Engineering*
Ethan Grentz | *Electrical Engineering*
Samuel Hass | *Product Design Engineering Technology*

Abstract:

Electric vehicles rely on powerful batteries that when damaged can combust into equally powerful fires. This often occurs during a process called thermal runaway, where one failing cell damages those adjacent, causing a cascading failure. To prevent this, battery cells must be lined with heat resistant materials that are lightweight and flexible. Highland Plastics is working on developing such material, but the process requires rapid and repeatable testing via standard UL2596. They tasked the student team with building a "Thermal Evaluator"; an automated test bench that performs the test, while recording and compiling the data to be included in industry compliant reports. The UL2596 Torch and Grit Test evaluates the ability of electric-vehicle battery enclosure materials to withstand direct high intensity flame exposure. This project involves replicating the torch aspect of this test in an automated system. During testing, a specimen is exposed to a jet flame that is produced by a specialized torch burner to assess structural integrity and thermal resistance in thermal runaway simulations. By testing temperatures of 1200 degrees Celsius, results allow for the selection of materials that are suitable for battery enclosures. This test bench utilizes a microcontroller to operate electromechanical devices and to interface with the thermocouples. The test is highly configurable via a native application, the data is easily accessible in .csv and graph form, and the bench itself is modular and customizable should Highland Plastic's needs change in the future.

SAPA TRANSMISSION

Project Name: Belleville Washer Stacking System
Academic Advisor: Dr. Terry Lerch | School of Engineering and Technology
Industry Advisor: Madeline St. Pierre | Manufacturing Engineer
Will Werner | Business Development Associate
Joe Glinski | Director of Manufacturing

TEAM MEMBERS:
Ashleign Black | *Product Design Engineering Technology*
Lucas Dailey | *Mechanical Engineering*
Grant Danner | *Electrical Engineering*
Kayla Gerard | *Mechanical Engineering Technology*
Gabrielle Olin | *Mechanical Engineering*
Breckin Prichard | *Mechanical Engineering*

Abstract:

The purpose of this project is to design a device that can automatically orient and stack Belleville washers of two different sizes into stacks of six and seven washers for use in combat vehicle transmissions. The customer needs a system that can generate approximately 2,000 correctly oriented stacks of Belleville washers per week, which equates to approximately 12,500 washers. Currently, an operator must create these stacks manually, which is an inefficient use of operator time and company resources. The system we propose consists of several stages of functioning, including the feeding, orientation, stacking, storage of parts, and the electronic control necessary for the functioning of the system. A vibratory feeder system is utilized to ensure continuous flow of the parts. As parts flow through the system, a mechanical orientation device guides the parts toward the sensing stage. Inductive proximity sensors detect the parts as they pass through the system, as these sensors are highly reliable in detecting metal parts in an industrial environment. The final design of the product allows for an automated system to function at maximum capacity to improve the consistency of the stacks of the Belleville washers and increase efficiency.

SUBMERSIBLE

Project Name: SUB Electrical Systems and Battery Power Supply Upgrade
Academic Advisor: Dr. James Morrison | School of Engineering and Technology
Industry Advisors: Dr. Don Uzarski | Department of Biology

TEAM MEMBERS:
Luke Stockoski | *Mechanical Engineering*
Brady Wood | *Product Design Engineering Technology*
Jessica Thompson | *Computer Engineering*
Alexis McMurray | *Mechanical Engineering*
Hong Bing Tang | *Computer Engineering*
Jakob King | *Computer Engineering*
Brendan Weliver | *Mechanical Engineering Technology*

Abstract:

The 2026 Uzarski Submarine senior design project focuses on the research, design, and implementation of improvements to the submarine's battery power supply and internal electrical systems. As provided by the customer specifications, improvements to energy efficiency, reliability, and safety while supporting extended underwater operations were the primary objectives of this senior design project. The team reviewed the existing submarines' power supply layout and reviewed alternative solutions, including lithium-ion and lead-acid systems, to identify performance limitations and potential design enhancements. Using calculations, physical inspection, and in-depth research, the team evaluated several design alternatives for battery replacements, fuse box designs, and electrical system updates. Key design considerations included current and voltage regulation, thermal management, physical sizing, and maintainability within the confined environment of the submarine. Through in-depth analysis and research, the team developed various iterations of potential design solutions for major project tasks. Each concept was evaluated against defined performance and safety criteria using a structured selection matrix to ensure objective comparison. This decision-making framework enabled the identification and implementation of the most effective and technically feasible solution. The resulting design selections reflect a balance of operational reliability, energy efficiency, and maintainability that are aligned with the customer's requirements.

VANTAGE PLASTICS A

Project Name: Precision Laser Leveling System
Academic Advisor: Dr. Ahmed Abdelgawad | School of Engineering and Technology
Industry Advisor: George Aultman | Vice President
John Tatton | Director of Engineering

TEAM MEMBERS:
Taylor Anderson | *Product Design Engineering Technology*
Cody Brenner | *Mechanical Engineering*
Johnathan Chambers | *Mechanical Engineering Technology*
Drew Moss | *Mechanical Engineering*
Annon Ziel | *Mechanical Engineering*

Abstract:

Ensuring parallel platens during the thermoforming process is critical to producing usable parts. To make sure the platens are parallel with each other, each of the platen's four corners must be measured before the start of every production cycle. Many thermoforming machines do not have the capabilities to self-level or produce this measurement for their operators. This leads to inaccurate measurements during this process. If the platens fall out of alignment during the process, the parts produced could be unusable. This problem is solved by a system that measures these distances with laser sensors and displays the results to the operators, so they can accurately adjust the platens. The system will be designed to be fixed to the machine at each corner to measure the distance between the platens to [Equation] of an inch. If the platens fall outside of this range, a display screen on the device will alert an operator to the issue with a red/green light system and display the measurements to the operators. Since the system is meant to stay on the machine during production, it is designed to be compact and stay out of the way of all moving parts. This system is more accurate than the previous method of using a tape measure to measure the distance.

VANTAGE PLASTICS B

Project Name: Extrusion Die Lift and Separation Device
Academic Advisor: Dr. Waseem Haider | School of Engineering and Technology
Industry Advisor: George Aultman | Vice President
John Tatton | Director of Engineering

TEAM MEMBERS:
Garett Bishop | *Product Design Engineering Technology*
Nicholas Christopher | *Mechanical Engineering*
Michael Moss | *Mechanical Engineering*
Tristan O'Neill | *Electrical Engineering*
Sidney Ganzie | *Mechanical Engineering Technology*

Abstract:

This Senior Design project, united with Vantage Plastics, focuses on the design and development of hydraulic lifting and separation device for the extrusion dies used in plastic manufacturing. The main goal of this project was to make the extrusion die maintenance process safer and more efficient. The objectives were to create a device to control the separation, lifting, and rotation of the dies for cleaning. The proposed system uses a dual-cylinder hydraulic lift controlled by a PLC system, with a hand crank gearbox to safely lift and rotate extrusion dies during the maintenance process. Stress calculations and finite element analysis were conducted to ensure structural integrity and compliance with OSHA, ISO, and ASME standards. The final design emphasizes safety, ease of use, cost-effectiveness, and manufacturability while reducing cleaning time and minimizing the number of operators needed.

InSciTE-WERC

Project Name: Logistics Containers for Artemis III Lunar Mission
Academic Advisor: Dr. Itzel Marquez | School of Engineering and Technology
Industry Advisor: Dr. Ginger Scarbrough | WERC Program Manager

TEAM MEMBERS:
Kayla Florian | *Environmental Engineering*
Bruno Jorgensen | *Actuarial Science, Statistics*
Maxwell Hornak | *Environmental Engineering*
Anna Lubbers | *Environmental Engineering*
Vibeke Rivet | *Mechanical Engineering*
Daniel Thanaslu | *Computer Engineering, Mathematics*

Abstract:

The WERC Environmental Design Contest is an interdisciplinary collegiate competition that takes place at New Mexico State University annually. This year, CMU is sending a team of seniors from the InSciTE program to represent the College of Science and Engineering. The team selected task 4 from a selection of environmentally relevant task statements for this year's contest. Task 4 of the WERC Environmental Design Contest challenges teams to create a logistics container that is energy self-sufficient, accessible, ergonomic, and easily repurposed. Design specifications require that the containers maintain an internal temperature between 4°C and 21°C and an internal pressure between 101 kPa and 56 kPa. The containers must be able to accommodate 130 Cargo Transfer Bags, which will contain 1,965 kilograms of supplies.

This project is part of the
international WERC Environmental Design Contest.

36th WERC
ENVIRONMENTAL DESIGN CONTEST
NEW MEXICO STATE UNIVERSITY

Learn more about WERC

XALT

Project Name: Mixing Vessel Hoist and Stand System
Academic Advisor: Dr. Joseph Langenderfer | School of Engineering and Technology
Industry Advisor: Connor Nowosatka | Engineering Oversight

TEAM MEMBERS:
Christian Oatman | *Industrial Engineering Technology*
Ethan Williams | *Mechanical Engineering*
Gibson Marr | *Mechanical Engineering Technology*
Nicole Olivieri | *Mechanical Engineering*
Zachary Clark | *Product Design Engineering Technology*

Abstract:

XALT Energy presented a challenge that the fabrication team faces when performing maintenance on their 1000-pound mixing heads. The proposed solution for this challenge is to present a safe method for extracting this mixing head. Adjacently XALT needs a stand for the mixing head to rest on to perform the necessary maintenance. The product development will reference existing lifting methods and current market options to produce a forklift attachment for XALT's desired needs. This development will undergo extensive research regarding lifting and hoisting operations. This research will formulate the team's decision-making when designing the forklift attachment. Calculations and analytical results support the specific parameters the team is constrained within. Finite element analysis (FEA) will simulate the stress and displacement that the forklift attachment and stand will undergo. This process estimates the stress and displacement observed, allowing for optimization of parameters to occur. The team will compare the properties of selected steel members to optimize the strength required for the task. The team will expect the forklift attachment to withhold a weight of 1000 pounds while sustaining a safety factor of five.

CMU School of Engineering and Technology

SENIOR DESIGN EXPO 2026

MECHATRONICS

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CENTRAL MICHIGAN UNIVERSITY

SMART MEDICATION REMINDER AND SECURE DISPENSER

STUDENTS:
Raad Sharar Zahin
Twaha Imtiaz Alim
ADVISOR:
Dr. Brian DeJong

Abstract:

The Smart Medication Reminder & Secure Dispenser is a mechatronics-based project designed to promote safe and timely medication use. The system uses a microcontroller and real-time clock to manage dosing schedules and actuates a motor-driven mechanism to dispense medication at programmed times. Alerts notify the user when medication is ready, reducing missed doses and improving safety.

THE PLANT NANNY

STUDENTS:
Addison LeBrun
Jonathan Sheffield
Andrew Anderson
Benjamin Meekoff
ADVISOR:
Dr. Brian DeJong

Abstract:

Our goal is to design an automated plant-watering system that delivers water based on selectable, pre-programmed timing intervals, allowing users to customize operation for a wide variety of plant types and environments. The system will also provide real-time atmospheric feedback, giving users meaningful data to help determine optimal placement and growing conditions for their plants. By combining automation with environmental monitoring, the design aims to improve plant health while simplifying everyday care.

HEAT BOX

STUDENTS:
Elizabeth Hopkins
Nathan Priestap
Joshua Wilson
ADVISOR:
Dr. Brian DeJong

Abstract:

Develop and build a temperature and light based automatic speaker/party system.

SELF-RIGHTING CANE

STUDENTS:
Lorena Reyes
Sof Berlanga
Vladimir VanGeel
ADVISOR:
Dr. Brian DeJong

Abstract:

This project aims to create a mechanism that can get a cane to return itself to an upright position after being laid or dropped on the ground. The reason behind building this project is to enhance the functionality of canes for people who have mobility and flexibility issues, which makes it difficult and even dangerous to pick up a cane once it is on the ground if they have no assistance. For the cane to propel itself upwards, we have decided on developing a mechanism based on a servo motor that controls a telescopic leg to push the cane into an upright position or a position that can be easily grabbed.

THERMO TRACKING FAN

STUDENTS:
Zach Paon
Brendan Borsh
Andrew Kelley
ADVISOR:
Dr. Brian DeJong

Abstract:

The Thermo Tracking Fan is designed to track a person using its thermal camera, automatically pointing towards them. The fan moves both horizontally and vertically on a mount to track the person wherever they go.

SODA THROWER

STUDENTS:
Taylor Parker
Ben Molina
Maaz Ahmed
ADVISOR:
Dr. Brian DeJong

Abstract:

This is a mechatronics device that can throw your favorite 12oz. at you.

TABLE TENNIS TRAINER

STUDENTS:
Ahmad Sleiman
Devin Funnell
Blake Chipman
ADVISOR:
Dr. Brian DeJong

Abstract:

This project involves the design and construction of an automated ping pong ball shooter capable of launching balls at controlled speeds and directions. The system uses DC motors and a microcontroller to regulate ball velocity and firing intervals. A guided feeding mechanism ensures consistent ball delivery into the launch wheels. The project demonstrates principles of motor control, rotational motion, and mechatronic system integration while producing a functional and reliable training
device.

ANGLE SENSING PUTTING MATT

STUDENTS:
Kayden Cotter
Alexis McMurray
Vibeke Rivet
ADVISOR:
Dr. Brian DeJong

Abstract:

The objective of this project is to construct a golf putting mat that provides immediate feedback on shot accuracy and is more affordable than other putting technologies on the market. The purpose of this system is to help golfers identify how far offline their putts are to make the necessary adjustments to their stroke. By sensing and displaying the angle of the golf ball relative to the center line, the system will allow the user to gain numerical feedback as opposed to solely visual judgment.

THE SECRET LOCKBOX

STUDENTS:
Isaiah Guadard
Jakob King
Gavin Mehl

ADVISOR:
Dr. Brian DeJong

Abstract:

Introducing the Secret Lockbox, a secure storage system containing several hidden compartments to keep your most valuable items safe. This lockbox is equipped with keypad authentication and hidden sensors and switches that unlock three hidden compartments. By using integrated sensor feedback and independent stepper motors, these hidden compartments open themselves to reveal their contents once activated. Thanks to the Secret Lockbox, you can cast your worries away and store your possessions securely.

PEEK-A-BUNNY

STUDENTS:
Alexis Marenger
Isabella Gnida

ADVISOR:
Dr. Brian DeJong

Abstract:

This project aims to create an interactive station for the Rosebush Elementary storybook walk. The purpose of the station is to increase student engagement, support literacy development, and make storybook walks more captivating for young learners. To accomplish this, our group designed a motion-activated “Peek-A-Bunny” system in which a stuffed bunny pops up out of a hole when a child approaches. In addition to the motion feature, the design incorporates a large programmable push-button that plays an audio clip related to the story. This allows teachers to easily change the audio for different books throughout the year, making the station both universal and reusable.

A-MAZE-ING SOLVER

STUDENTS:
Grant Minthorn
Temirlan Jandaliyev
ADVISOR:
Dr. Brian DeJong

Abstract:

The objective of this project is to construct a golf putting mat that provides immediate feedback on shot accuracy and is more affordable than other putting technologies on the market. The purpose of this system is to help golfers identify how far offline their putts are to make the necessary adjustments to their stroke. By sensing and displaying the angle of the golf ball relative to the center line, the system will allow the user to gain numerical feedback as opposed to solely visual judgment.

SELF-PARKING RC CAR

STUDENTS:
Luke Vingren
Quin Quidort
Artem Pohrebniak
ADVISOR:
Dr. Brian DeJong

Abstract:

This project focuses on designing and building a self-parking RC car that can automatically maneuver into a parking space without user input. The vehicle uses ultrasonic distance sensors to detect nearby obstacles and measure available space. An Elegoo UNO R3 microcontroller processes the sensor data and sends control signals directly to the RC car's remote control circuitry, allowing it to control steering and motor movement. The original RC car is modified to allow full control of the system and to enable it to park autonomously.

AUTOMATIC CHICKEN COOP DOOR

STUDENTS:
Jonathan Maxwell
Gabrielle Tucker
ADVISOR:
Dr. Brian DeJong

Abstract:

This project is an automatic chicken coop door that opens and closes based on ambient light conditions. The door opens during daylight hours and closes when ambient light drops below a programmed threshold. Chickens are especially vulnerable to predators at night, and needing to close the coop door is a tedious task. Leaving it open can result in loss of livestock to both predators and environmental conditions. The system will also include a manual override switch that allows the user to lock the door in the closed position when desired to perform maintenance within the coop/run areas.

BB8

STUDENTS:
Jacob Buzzy
Tony Chemali
ADVISOR:
Dr. Brian DeJong

Abstract:

This project involves the design and construction of a life sized BB8 inspired rolling droid. The robot is powered by DC gear motors and controlled by using an Arduino. A Bluetooth module allows wireless control from a smartphone. The internal drive system is mounted inside the bottom spherical shell, while strong neodymium magnets maintain the attachment between the internal drive platform and the external dome head. This project integrates mechanical design, electronics, and programming in C+ to create a functional rolling robot.

CARD DEALER

STUDENTS:
Patricia Cosma
Kennedy Pagel
Jeremy Pfeifer

ADVISOR:
Dr. Brian DeJong

Abstract:

A robot that deals cards, specializing in multiple card games. The user can input the number of players, and the robot will deal the correct number of cards to each person. If playing blackjack, two sensors will be used to allow the players to stand or hit, before moving on to the next player.

WIPER GOGGLES

STUDENTS:
Noah Paseka
Ethan Williams
Joe Hoy

ADVISOR:
Dr. Brian DeJong

Abstract:

This project focuses on the design of an automated lens-clearing system for lab goggles. We have noticed a significant issue with lab goggles around the world, becoming hard to see through due to liquids on the lenses. We will design a custom wiper mechanism paired with a moisture sensor for automatic clearing of the lenses. We will utilize a servo motor and battery pack to move and power the system.

DANCING CRAB

STUDENTS:
Austin Gulick
Mark Kingsworthy

ADVISOR:
Dr. Brian DeJong

Abstract:

Crabs are an example of convergent evolution. Unrelated species evolved into crabs several different times throughout history. This implies that crabs are not only inevitable, but also well-designed. The goal of this project is to make a dancing crab that mirrors the movements of the user. The crab will be able to step side to side and wave its arms. This is important because it provides a fun way for people to interact with a higher life form.

TOUCH-FREE HAND WASHING ENFORCEMENT SYSTEM

STUDENTS:
Devin Rozzano
Yogendra Chouhan
ADVISOR:
Dr. Brian DeJong

Abstract:

This project designs and constructs a touch-free hand washing enforcement system that ensures users properly wash their hands before exiting a restroom. Using an Arduino-based control system, IR sensing, water flow monitoring, automated soap dispensing, and a solenoid door lock, the system verifies hand washing duration and controls exit access. The project demonstrates practical applications of mechatronics, embedded systems, and automation while promoting improved hygiene compliance.

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CENTRAL MICHIGAN UNIVERSITY

Title: Automotive Modeling
Students Name: Ionna Zeleniuk
Advisor: Dr. David Kelley

Abstract: A common practice in the automotive industry is the creation of full-scale clay models to produce tangible, three-dimensional representations of vehicle designs. These physical models allow designers to directly interact with the form and make physical refinements that are not as easily achieved through CAD modeling or sketching alone. The ability to see and touch a design plays a crucial role in the physical concept development process. In this project, that methodology was replicated with a half section model at a 1:5 scale, using a design based on a sketch of the Audi TT.

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CLUB CONNECT

STUDENTS:
Vicente Vargas
Bode Carpenter
Christian Wang
Dakarai Barrow
Meghan Malone-Johnson
Sean Peterson
Travis Turner

ADVISORS:
Dr. Patrick Kinnicutt
Lugo Virgilio

Abstract:

ClubConnect is a real-time communication platform designed to streamline communication between DJs and nightlife venues through a modern and scalable messaging system. In the live entertainment industry, booking and coordinating performances often relies on fragmented communication methods such as social media messages, emails, or informal contacts, which can create delays and miscommunication. ClubConnect addresses this challenge by providing a centralized platform where DJs and venue managers can efficiently connect, discuss opportunities, and coordinate event details in real time.

CRIMINAL CAPITAL

STUDENTS:
Marshaun Adamn
Aiden Alfkaiki
David Neese
Even Reynolds
Gage Lefevre
Jace Waller
Ronald Simmons

ADVISORS:
Dr. Patrick Kinnicutt

Abstract:

Criminal Capital is a Unity Engine game that is extraction based, where the player is responsible for infiltrating a building, thieving valuables without leaving any trace or getting caught. The game will start with a tutorial on basic controls and concepts. The player will utilize a shop to sell its valuables to purchase upgrades such as more inventory slots or increased running speed. As the player progresses, more buildings will become available with more valuables. If the player is caught, it loses all the valuables and must pay money as a penalty. The game ends once the player is caught 3 times, until then steal as much as you can!

GRAVITY COURIER

STUDENTS:
Joseph Hammock
Vic Westmoreland
Aurelia Deines
Wyatt Cook
Brian Vorac
Brayden Kielb

ADVISORS:
Dr. Patrick Kinnicutt

Abstract:

Gravity Courier is a 2D Platformer designed in Unity where you play as a courier for a space corporation. Players navigate hazardous planetary environments, avoid obstacles and enemies, and deliver important packages across different levels in the solar system. The game focuses on responsive controls, engaging level design, and immersive storytelling to create a polished and enjoyable platforming experience.

BIONIC ENHANCEMENT: A NEURAL INTERFACE FOR LIMB CONTROL

STUDENTS:
Morgan Erickson
Naomi Keaikitse
Zachary Haring
Yousef Wahbeh
Alec Pionk
Andrew Abdelaty
Arshia Orouji

ADVISORS:
Dr. Patrick Kinnicutt

Abstract:

The Bionic Enhancement project is a mind-machine interface system designed to translate neural signals into robotic movements. Using electroencephalography (EEG) and electromyography (EMG) data captured from the UltraCortex headset, our system processes these signals through a multi-stage pipeline consisting of signal cleaning, feature extraction, intent classification, and command generation. The processed data is then used to control a virtual robotic hand in real-time, demonstrating how neural input can be accurately translated into precise digital output. Our approach combines hardware integration, signal processing, machine learning, and 3D visualization to create a comprehensive neural interface system. This project showcases the potential of brain-computer interfaces in controlling external devices and has applications in prosthetics, assistive technology, and human-machine interaction.

SIDEKICK

STUDENTS:
Mathew Staudacher
Joshua Snow
Ali Jawed
Pratham Patel
Jeffrey Timoteo
Pratham Agarwal

ADVISORS:
Dr. Patrick Kinnicutt

Abstract:

SideKick™ is a modular, cross-platform campus accessibility navigator designed to address persistent barriers faced by disabled students, faculty, staff, and visitors. Despite ADA compliance standards, many campuses—including Central Michigan University—lack real-time navigation tools and personalized accessibility routing. These gaps contribute to reduced participation, lower retention rates, and diminished student success among disabled learners. SideKick™ responds to this need by transforming campus navigation into an inclusive, data-driven, and empowering experience. Developed as a Web-based and mobile application, in Unity using built-in features such as NavMesh Agents for intelligent pathfinding, SideKick™ delivers optimized indoor and outdoor routing tailored to individual mobility and sensory preferences. Users can apply accessibility filters (e.g., wheelchair access, quiet zones, gender-inclusive restrooms), receive AI-powered alternate route suggestions, and access emergency features such as accessible exits and shelter locations. The platform supports full accessibility functionality, including text-to-speech, voice commands, and screen reader compatibility. By combining adaptive routing, accessibility customization, and AI-supported navigation, SideKick™ aims to reduce navigation stress, increase participation in campus life, and improve retention and graduation outcomes among disabled students.

XSKILL: A PEER-TO-PEER SKILL EXCHANGE PLATFORM FOR STUDENTS

STUDENTS:
Aksh Chaturvedi
Akshaya Baitinti
Brevin Ford
Matthew Ortega
Puneeth Anningi
Sishir Gottumukkala
Syeda Mahreen

ADVISORS:
Dr. Patrick Kinnicutt

Abstract:

XSkill, previously called SwapSkill, is a peer-to-peer platform designed to help students exchange skills with one another instead of paying for courses or tutoring. Many students possess valuable skills such as graphic design, coding, video editing, language tutoring, music, or academic help, but there is no simple system to trade these abilities with others. Our platform allows students to create profiles listing the skills they can teach and the skills they want to learn. Using a credit-based exchange system, students earn points by teaching others and spend those points to learn new skills from peers. This creates a collaborative learning environment where knowledge becomes accessible and affordable for everyone. The goal of XSkill is to build a campus community where students help each other grow professionally and personally. The platform encourages collaboration, networking, and real-world skill development while reducing the financial barriers to learning new abilities. The system is designed with a simple user interface, profile matching, and a skill marketplace where users can search for skills offered by other students. Future development could include ratings, scheduling tools, and integration with university systems.

HIRELYTICS

STUDENTS:
Aaliyah Davis
Deandra Akpomon-Daniels
Edom Belayneh
Emma Vandenstorm
Grace Okoro
Jessica Servis
Nicholas Smith

ADVISORS:
Dr. Patrick Kinnicutt

Abstract:

Hirelytics is a full-stack web platform designed to improve the hiring process for both applicants and recruiters. Built with Next.js, React, TypeScript, Clerk, and Firebase, it provides workflows for job discovery, application tracking and insight, and recruiter job management. The project emphasizes modular architecture, cloud-backed data handling, and comprehensive automated testing using Vitest and React Testing Library. Overall, Hirelytics delivers a scalable, secure, and reliable solution for connecting job seekers with hiring teams.

INTERVENTIVE LEARNING

STUDENTS:
Michael Kositzke
Kolbi Esch
Aiden Verbison
Devon Burton
Daniel Abikphi
Viah Alma
Bret Albright
Tyler Mahoney
Lucas Forbes
Marcus Rachow
Tate Besteman
James Turner
Abdelrahman Shamsan
Rayen Aouadi

ADVISORS:
Dr. Patrick Kinnicutt

Abstract:

Interventive Learning is an adaptive education platform that enhances student proficiency in Math through personalized learning plans and AI-driven interventions. This platform is built with React to create a modern, user-centric design. The system is designed to dynamically update user proficiency and track their progress—implementing AI-driven interventions when a student falls below a certain proficiency threshold. It also provides teachers with an easy way to track students and identify individuals who require additional attention. Ultimately, Interventive learning's dynamic system will enable teachers to efficiently teach and identify students in need and provide students with supplemental AI-interventions that enhance their proficiency.

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